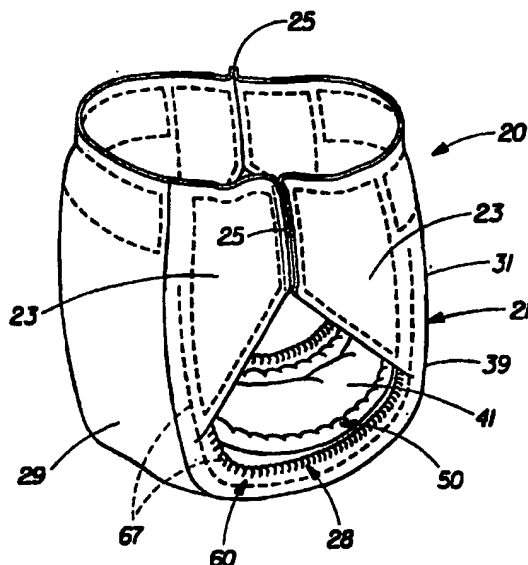


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(54) Title: ABSORBENT ARTICLE HAVING AN IMPROVED LEG CLOSURE



## (57) Abstract

This is absorbent articles such as disposable diapers, incontinent briefs, pull-on diapers, diaper holders and the like, that provide maximized dynamic fit range in the waist opening and improved gasketing action along the leg openings. Side panels (23) extend outwardly from side flaps (37) to provide a wide fit range in the waist opening. The side flaps (37) comprise no elastic for gasketing action and the flaps are relatively narrow. Extended leg cuffs (60) are connectively associated with a chassis (21) along the side flaps (37) so as to provide the gasketing action. Each of the extended leg cuffs (60) has a free distal edge (65) remote from the side flap (37) and a spacing member (67) for spacing the distal edge (65) upwardly away from the absorbent chassis (21). This absorbent article has enough width in the side panels (23) and enough width in the leg openings as needed.

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Absorbent Article Having An Improved Leg ClosureFIELD OF THE INVENTION

The present invention relates to absorbent articles such as diapers, incontinent briefs, pull-on diapers, diaper holders, and the like, and more particularly, to absorbent articles having elastic leg features providing dynamic fit about the wearer as well as improved comfort characteristics of the absorbent article.

BACKGROUND OF THE INVENTION

The major function of absorbent articles such as disposable diapers and incontinent briefs or undergarments is to absorb and contain body exudates. Such articles are thus intended to prevent body exudates from soiling, wetting, or otherwise contaminating clothing or other articles, such as bedding, that come in contact with the wearer. Contemporary disposable diapers have a topsheet, a backsheet, an absorbent core, and elasticized side flaps with one or more elastic members adjacent the longitudinal edge of the diaper to form elasticized leg openings. These elasticized side flaps prove effective generally to prevent wicking and overflow from the fluid laden diaper to clothing contacting the edges of the diaper in that the elasticized side flaps present a fluid impervious barrier between the edge of the diaper and the contacting clothing, and in addition, provide a gasketing action about the legs of the wearer to maintain a seal about the leg and minimize gapping.

With regard to pull-on diapers such as training pants, have become popular, especially for use on toilet-training children. In the past some training pants have been made elastically extensible using stretchable side panel disposed in the training pants such that the waist opening and leg openings having such elasticized side flaps are at least partially encircled with elasticized bands. Another type of pull-on diapers' stretchable side panel is formed by attaching discrete stretchable members to the edge of each side flap of the disposable garment in the front waist area and the rear waist area. While the stretchable side panel described above are useful to form pull-on diapers, it has been found that the wide stretchable side panels are preferable to sustain wide range dynamic fit.

However, while the stretchable side panel should be attached to the edge of the side flap, or the stretchable side panel should be associated to the side flap, the width of such stretchable side panels and the width of the elasticized side flap are considered as parameters to be balanced in order to provide an appropriate waist fit range in the waist opening, and an effective gasketing action about leg openings.

width of such stretchable side panels and the width of the elasticized side flap are considered as parameters to be balanced in order to provide an appropriate waist fit range in the waist opening, and an effective gasketing action about leg openings. Thus, it was difficult to maximize functions of the stretchable side panels and the elasticized side flaps through maximization of the balanced width between the stretchable side panel and the elasticized side flaps.

Furthermore, such stretchable side panel is being applied to a diaper having a closure system such as an adhesive tape fastening system for a closure of a front portion and a rear portion of the diaper, the above difficulty is found among any type of absorbent articles having such stretchable side panel.

Therefore, it is an object of the present invention to provide an absorbent article which has enough width of the stretchable side panels and enough width of the elasticized leg openings at need, so as to maximize both dynamic fit range in the waist opening and improve gasketing action along the leg openings.

#### SUMMARY OF THE INVENTION

According to the present invention, an absorbent article comprises an absorbent chassis, a pair of side flaps, a pair of side panel, a pair of longitudinal extended leg cuff. The absorbent chassis has a front portion, a rear portion, a crotch portion joining the front portion and the rear portion, and a pair of side edges in the longitudinal direction throughout the front, crotch and rear portion. A pair of side flaps extend outwardly from each side edge of the absorbent chassis, each side flap having a side edge. A pair of side panels extend outwardly from the side edge of the side flap in the front portion and the rear portion. A pair of longitudinal extended leg cuffs are connectively associated with the absorbent chassis along the side flap in the crotch portion and extending longitudinally at least partially into the front portion and the rear portion. Each of extended leg cuffs has a free distal edge remote from the side edge of the side flap at least in the crotch portion so as to extend outwardly from the side flap. Each of the extended leg cuffs comprises a spacing means disposed in at least the crotch portion for spacing the distal edge upwardly away from said absorbent chassis.

#### BRIEF DESCRIPTION OF THE DRAWINGS

While the specification concludes with claims particularly pointing out and distinctly claiming the subject matter which is regarded as forming the present invention, it is believed that the invention will be better understood from the

following description which is taken in conjunction with the accompanying drawings in which like designations are used to designate substantially identical elements, and in which:

Figure 1 is a perspective view of the disposal pull-on diaper embodiment of the present invention in a typical in-use configuration as it would be applied to a wearer;

Figure 2 is a plan view of the chassis of the pull-on diaper embodiment of the present invention having portions cut away to reveal the underlying structure, the surface which will form the outer surface of the disposable garment facing away from the viewer;

Figure 3 is a fragmentary sectional view taken along section line 3-3 of Figure 2;

Figure 4 is a fragmentary sectional view taken along section line 4-4 of Figure 2.

Figure 5 is a fragmentary sectional view taken along section line 5-5 of Figure 2.

#### DETAILED DESCRIPTION OF THE INVENTION

As used herein, the term "absorbent article" refers to devices which absorb and contain body exudates, and, more specifically, refers to devices which are placed against or in proximity to the body of the wearer to absorb and contain the various exudates discharged from the body. The term "disposable" is used herein to describe absorbent articles which are not intended to be laundered or otherwise restored or reused as an absorbent article (i.e., they are intended to be discarded after a single use and, preferably, to be recycled, composted or otherwise disposed of in an environmentally compatible manner). A "unitary" absorbent article refers to absorbent articles which are formed of separate parts united together to form a coordinated entity so that they do not require separate manipulative parts like a separate holder and liner. A preferred embodiment of the unitary disposable garment of the present invention, disposable pull-on diaper 20, is shown in Figure 1. The pull-on diaper 20 of Figure 1, comprise an absorbent chassis 21, stretchable side panels 23, side seams 25, and dual leg cuffs 27 about leg openings 28.

Figure 2 is a partially cut-away perspective view of the disposable pull-on diaper 20 of Figure 1, prior to the front portion 29 and the rear portion 31 of the absorbent chassis 21 being joined together by the side seams 25. The absorbent chassis 21 of the present invention preferably has a symmetric, modified hour-glass shape. The absorbent chassis 21 will have at least a front portion 29, a rear portion 31, a crotch portion 33, longitudinal side regions 35, and a stretchable side panel 23 operatively attached to the side flaps 37 in the front portion 29 and the rear portion 31. The side flaps 37 are formed from the extension of the backsheet 39 and the topsheet 41 extending outwardly from and along the side edges 43 of the absorbent core 45 in at least the crotch portion 33. The side flap 37 of the present invention is relatively narrower than a side flap 37 being elasticized with one or more elastic members as is known in the art. The dual leg cuffs 27 comprise a stand-up barrier cuff 50 and an extended leg cuff 60 which will be described in greater detail herein below.

#### EXTENDED LEG CUFF

As shown in Figs. 2 and 3, the extended leg cuffs 60 of the present invention provide dynamic fit and skin comfort as well as a structure to restrain the free flow of body exudates along the topsheet 41 and to hold and contain such exudates within the diaper 20 and to provide a gasketing action about the wearer. Each extended leg cuff 60 is a flexible member 61 having a proximal edge 63 and a distal edge 65. As used herein, the term "flexible" refers to materials which are compliant and will readily conform to the general shape and contours of the body. In addition, if the spacing means 67 comprises one or more elastic members, the extended leg cuffs 60 must be contractible so that the distal edges 65 may be sufficiently spaced away from the topsheet 41. The extended leg cuffs 60 may be manufactured from a wide variety of materials such as polypropylene, polyester, rayon, nylon, foams, plastic films, formed films, elastic laminates and elastic foams. A number of manufacturing techniques may be used to manufacture the extended leg cuffs 60. For example, the extended leg cuffs 60 may be woven, non-woven, spunbonded, carded, a laminate of a non-woven polypropylene material secured to a liquid impermeable polyethylene film, or the like as is known in the art.

As shown in Figs. 2 and 3, the extended leg cuff 60, and more particularly, the proximal edge 63, is disposed adjacent to and preferable inboard of the longitudinal edge 69 of the diaper 20. The term "inboard" is defined as the direction toward the centerline 71 of the diaper 20. The proximal edge 63 is preferably disposed inboard of the longitudinal edge 69 so that exudates, especially loose fecal

material which is not easily absorbed and tends to float along the topsheet 41, will contact the extended leg cuff 60 before it can contact the edges 69 of the diaper 20. Thus, the proximal edge 63 is preferably disposed between the longitudinal edge 69 and the longitudinal centerline 71 of the diaper 20, more preferably, between the longitudinal edge 69 and the side edge 43 of the absorbent core 45 in at least the crotch portion 33 of the diaper 20. Most preferably, the proximal edge 63 is disposed along the side of the longitudinal edge 69 in at least the crotch portion 33 of the diaper 20. (It should be noted that if the stand-up barrier cuffs 50 are elasticized by one or more flap elastic members to form a stand-up leg gasketing cuff adjacent each the side edge 43 of the absorbent core 45, as is known in the art, then the proximal edge 63 of the extended leg cuff 60 is preferably positioned between the proximal edge 63 of the stand-up barrier cuff 50 and the longitudinal edge 69 in at least the crotch portion 33.)

The proximal edges 63 and the distal edges 65 of the extended leg cuff 60 are in a spaced relation to each other and define the effective width of each of the extended leg cuffs 60. The proximal edges 63 and the distal edges 65 may be in a parallel, nonparallel, rectilinear or curvilinear relationship. In addition, each of the extended leg cuffs 60 may have a variety of different cross-sectional areas including circular, square, rectangular or any other shape. Preferably, the proximal edge 63 is spaced from the distal edge 65 in a parallel and rectilinear relationship. The effective width of the extended leg cuff 60 is an important parameter in reducing leakage of body exudates out of the diaper 20. If the effective width of the extended leg cuff 60 is too small, then gaps will be formed between the leg of the wearer and the distal edge 65 such that liquids may flow over the distal edge 65 to the periphery 73 of the diaper 20. The extended leg cuff 60 of the present invention does not affect to the width of stretchable side panel 23 while the side flap 37 comprises no elastic members for providing gasketing action and the flap 37 is relatively narrow. Thus, the extended leg cuff 60 can have a relatively wide width at need so as to provide an effective gasketing action. Of course, the effective width should be dimensionalized as the size of the wearer increases or decreases, particularly with adult wearers.

The distal edge 65 of each extended leg cuff 60 is preferably not secured to any underlying elements of the diaper 20 in at least the crotch portion 33 so that it may be spaced away from the topsheet 41. The distal edge 65 is preferably spaced away from the topsheet 41 so that the extended leg cuff 60 is easier to apply to the wearer and ensures that the fit of the extended leg cuff 60 is in the "no motion" zone in the crotch portion 33 with a snug fit about the wearer's buttocks. As used herein,

"spaced" includes embodiments wherein the distal edges 65 may assume one or more positions relative to the topsheet 41 including at some times assuming a position adjacent the topsheet 41.

The distal edge 65 of each extended leg cuff 60 is disposed inboard of the proximal edge 63, preferably outboard of the proximal edge 63 in the front portion 29 and the rear portion 31, so as to avoid gaps may be formed between the leg of the wearer and the distal edge 65, and present a more effective barrier against the flow of exudates. The term "outboard" is defined as the direction away from the centerline 71 of the diaper 20 that is parallel to the respective edge of the diaper 20 along which the extended leg cuff 60 is disposed. (i.e., the direction opposite from the direction defined by the term "inboard.") The distal edges 65 are maintained outboard of the proximal edges 63 in both the front portion 29 and the rear portion 31 by a closing means 75 so as to obviate their inversion. As seen in Figs. 2, 3 and 4, in a preferred embodiment of the present invention, the closing means 75 is located in a closure zone 77 which is disposed outboard of the side flaps 37 and, in the same embodiment, or in another preferred embodiment of the present invention, at least a portion of the closing means 75 is positioned above at least a portion of the stretchable side panel 23.

The distal edges 65 are also shown in Figs. 2 and 4, to be disposed parallel to each other and perpendicular to the end edge 79 of the diaper 20 in the front portion 29 and the rear portion 31. While this is a preferred embodiment, the distal edges 65 may alternatively be angled toward or away from each other, especially toward each other if the extended leg cuffs 60 are manufactured from a material having less extensibility, such that the distal edges 65 are disposed non-perpendicular to the end edges 79. Angling the extended leg cuffs 60 relative to the end edge 79 may assist in allowing the extended leg cuff 60 to curve outwardly with expanded stretchable side panels 23 during use so as to provide snug fit along leg opening 28.

The distal edges 65 are preferably laterally spaced apart from each other in the crotch portion 33. The lateral spacing of the distal edges 65 is especially important in the crotch portion 33 to provide easiness on application to the wearer and ensure that the fit of the extended leg cuffs 60 outwardly extended from the centerline 71 of the diaper 20, with a snug fit. Of course, the lateral spacing should be dimensionalized as the size of the wearer increases or decreases, especially for adult wearers.



A preferred embodiment of the diaper 20 shown in FIG. 1 is provided with each of the extended leg cuffs 60 joined to the side flaps 37 of the diaper 20. The term "joined" includes any means for securing the extended leg cuff 60 to the diaper 20, and includes embodiments wherein the extended leg cuffs 60 are separate members directly or indirectly secured to the side flaps 37 or embodiments wherein the extended leg cuffs 60 are constructed from the same member or material as an element of the diaper 20 such as stand-up barrier cuff 50 so that the extended leg cuffs 60 are a continuous and undivided element of the stand-up barrier cuff 50. The extended leg cuffs 60 may alternatively be joined to the backsheet 39, the topsheet 41, or any combination of these or other elements of the diaper 20. In the preferred embodiment, the extended leg cuffs 60 are joined with the side flaps 37 (directly to the portion of the topsheet 41 and backsheet 39 forming the side flap 37 ) by the seal means 81 such as adhesive to form the proximal edge 63, the distal edge 65 being formed by folding an end of the material 61 back upon itself and being secured to another segment by the distal attachment means 83. Preferably, the end of the material 61 is back upon itself and sealed to the distal edge 65 by the seal means, more preferably, sealed to the innerface or outerface of the backsheet 39 of the side flap 37 by seal means as shown in Fig. 3. In the preferred embodiment shown in Fig. 3, the extended leg cuff 60 are constructed from the same material of the stand-up barrier cuff 50. Preferred material of such preferred embodiment is 20 gsy hydrohobic polypropylene carded nonwoven.

The proximal edges 63 and the side flaps 37 are joined together in any suitable manner. As used herein, the term "joined" encompasses configurations whereby the proximal edges 63 are directly secured to the side flap 37 by affixing the proximal edges 63 directly to the side flap 37 and configurations whereby the proximal edges 63 are indirectly secured to the side flap 37 by affixing the proximal edges 63 to intermediate members which in turn are affixed to the side flap 37. In a preferred embodiment, the proximal edges 63 and the side flaps 37 are directly secured to each other at least in the crotch portion 33 by the seal means 81.

The seal means 81 of the present invention for joining the proximal edges 63 to the side flaps 37 are shown in FIG.3. The seal means 81 provide a seal along the proximal edge 63 to present a barrier to the wicking of liquids through the topsheet 41. While the topsheet 41 or the absorbent core 45 may extend beyond the seal means 81, protection against leakage of liquids emanating from the edges of the absorbent core 45 or wicking along the topsheet 41 may be enhanced by making the topsheet 41 or the absorbent core 45 not extend beyond the proximal edge 63. The

seal means 81 may be any means for securing the proximal edges 63 to the side flaps 37 such as adhesives, heat/pressure sealing, ultrasonic bonding, pressure sensitive adhesive double coated tapes, or any other means or methods as are known in the art. The seal means 81 are preferably three adhesive lines or spiral lines consisting of hot melt adhesive such as adhesives manufactured by Eastman Chemical Products Company of Kingsport, Tennessee and marketed under the trade name Eastbond A-3 or by Century Adhesives, Inc. of Columbus, Ohio and marketed under the trade name Century 5227. In the preferred embodiment, the seal means 81 consists of a nonwoven fabric strip enclosing elastomeric adhesive.

The spacing means 67 for spacing the distal edge 65 away from the topsheet 41, is any member which gathers, contracts, stiffens, shortens or otherwise acts on the extended leg cuff 60 so as to cause the extended leg cuffs 60 to stand up to provide easiness on application to the wearer and a gasketing action about the buttocks of the wearer to provide a snug fit.

As shown in Figs. 2 and 3, the spacing means 67 preferably comprises elastic members operatively associated with each of the extended leg cuffs 60 adjacent the distal edge 65. The elastic members 67 are preferably secured to the extended leg cuff 60 in an elastically contractible condition so that in a normally unrestrained configuration, the elastic members 67 effectively contract or gather the distal edge 65 of the extended leg cuff 60. The elastic members 67 can be secured to the extended leg cuff 60 in an elastically contractible condition in at least two ways as is discussed in U. S. Pat. No. 3,860,003 entitled "Contractible Side Portion For Disposable Diaper", which issued to Kenneth B. Buell on Jan. 26, 1974, which is incorporated by reference herein. In addition, the length of the elastic member 67 in general is dictated by the diaper design. In the embodiment illustrated in FIG. 2, the elastic member 67 extends along essentially the entire length of the extended leg cuff 60 in the crotch portion 33, although other lengths are cognizable.

As shown in Figs. 2 and 3, the elastic member 67 is operatively associated, with the extended leg cuff 60 by securing it within the extended leg cuff 60 with an elastic attachment means 85. The elastic attachment means 85 should be flexible and of sufficient adhesiveness to hold the elastic member 67 in its stretched condition. While the elastic members 67 may be secured to the extended leg cuff 60 adjacent only the end of the elastic member 67, it is preferable to secure the entire length of the elastic member 67 to the extended leg cuff 60. The elastic attachment means 85 herein are preferably glue beads made of hot melt adhesive such as marketed by

Findley Adhesives Incorporated, Elmgrove, Wisconsin, as Findley Adhesives 581, although the elastic members 67 may be affixed to the extended leg cuff 60 in any of several other ways which are well known in the art. For example, the elastic members 67 may be ultrasonically bonded or heat/pressure sealed into the extended leg cuff 60 using a variety of bonding patterns, or the elastic members 67 may simply be glued to the extended leg cuffs 60. A more detailed description of the manner in which the elastic members 67 may be positioned and secured to the extended leg cuff 60 can be found in U.S. Pat. No. 4,081,301, entitled "Method and Apparatus for Continuously Attaching Discrete, Stretched Elastic Strands to Predetermined Isolated Portions of Disposable Absorbent Products" which issued to Kenneth B. Buell on Mar. 28, 1978, and in U. S. Pat. No. 4,253,461, entitled "Absorbent Brief" issued to Danny L. Strickland and Ronald B. Visscher on Mar. 3, 1981, both of which are incorporated herein by reference. It should be noted that one or more (a plurality of) elastic members 67 can be used to elasticize each extended leg cuff 60. Preferably, one or two elastic members 67 are used to elasticize each extended leg cuff 60.

An elastic member 67 which has been found suitable is an elastic strand having a cross section of 0.18 mm by 1.5 mm and made from natural rubber as available from Easthampton Rubber Company of Stewart, Virginia, under the trademark L-1900 Rubber Compound. Other suitable elastic members 67 can be made from natural rubber, such as elastic tape sold under the trademark Fulflex 9411 by Fulflex Company of Middletown, Rhode Island. The spacing elastic member 67 may also comprise any heat shrinkable material as is well known in the art. Other suitable elastic materials may comprise a wide variety of materials as are well known in the art include elastomeric films, polyurethane films, Lycra, elastomeric foams and formed elastic scrim. In the preferred embodiment, the elastic members 67 and the elastic attachment means 85 can be formed by an adhesive strip stretched having a thickness of 0.5 mil as available from Findlay Adhesives Incorporated, Elm Grove, Wisconsin as Findley Adhesives 581, sold under trademark H 2330.

In addition, the elastic members 67 may take a multitude of configurations. For example, the width of the elastic members 67 may be varied; the elastic members 67 may comprise a single strand or several parallel or non-parallel strands of elastic material; or the elastic members 67 may be rectilinear or curvilinear.

The spacing means 67 for spacing the distal edge 65 away from the topsheet 41 may alternatively comprise several other elements. For example, the extended leg

cuff 60 may have stiffening means disposed in or on each extended leg cuff 60. The stiffening means must be sufficiently stiff so that the distal edge 65 is spaced away from the topsheet 41. Suitable materials for the stiffening means include foams, non-woven fabrics, batting, polyethylene film, foamed films, spray glues, foamed elastomers, polyester, polyurethane, or high loft materials.

The spacing means 67 may also comprise means for shortening the length of the distal edge 65 in comparison to the length of the edges of the diaper 20. The distal edge 65 can be shortened by making a fold or pleat in the distal edge 65. This fold or pleat is secured by any of the holding means well known to those of ordinary skill in the art, such as adhesives or heat sealing. Alternatively, a section may be cut out of the distal edge 65 and the resultant edges brought together to form a butt or lap joint. The distal edge 65 may also be shortened by attaching a length of the distal edge 65 to the topsheet 41 at a position different from where the distal edge 65 would lie when the diaper 20 is in a flattened out condition. Other shortening techniques as are known in the art may also be used.

The closing means 75 for securing the front end and the rear end, respectively, of the extended leg cuff 60 closed are shown in FIGS. 2, 3, and 4. The closing means 75 provide a more comfortable fit for the wearer and secure the distal edges 65 of the extended leg cuff 60 in the proper position to form an sufficient gasketing cuff. In a preferred embodiment, the closing means 75 are disposed in the front portion 29 and in the rear portion 31. The remaining portions of the distal edges 65 are preferably not secured to any underlying structure of the diaper 20 so that the distal edges 65 are left freely openable. In a preferred embodiment shown in Fig 2, the closure zones 77 are formed on the above of the stretchable side panel 23 adjacent to the leg opening 28 (adjacent to the crotch portion 33 ). This construction is preferred so as to create a snug fit about the buttocks of the wearer to especially prevent leakage from a joint of the stretchable side panel 23 and the extended leg cuff 60 as well as flexibility on width of the stretchable side panel 23. In the preferred embodiment, the closing means 75 closed entire length of the front end and the rear end overlapped on the front ear and the rear ear respectively.

While the closing means 75 may comprise any of several securement means as are known in the art such as ultrasonic bonds or heat/pressure bonds or seals using a variety of bonding patterns, or adhesives and/or glues, the closing means 75 are preferably adhesive beads consisting of hot melt adhesive such as manufactured by Eastman Chemical Products Company of Kingsport, Tennessee and marketed under

the trade name Eastbond A-3 or by Century Adhesives, Inc. of Columbus, Ohio and marketed under the trade name Century 5227.

#### STAND-UP BARRIER CUFF

The dual leg cuff 27 further comprises the stand-up barrier cuff 50. The stand-up barrier cuff 50 may comprise several different embodiments for reducing the leakage of body exudates in the leg opening 28. U.S. Patent 4,909,803 entitled "Disposable Absorbent Article Having Elasticized Flaps" issued to Aziz and Blaney on March 20, 1990, describes a disposable diaper having "stand-up" elasticized flaps (barrier cuffs) to improve the containment of the leg regions. U.S. Patent 4,695,278 entitled "Absorbent Article Having Dual Cuffs" issued to Lawson on September 22, 1987, describes a disposable diaper having dual cuffs including a gasketing cuff and a barrier cuff. U.S. Patent 4,704,115 entitled "Disposable Waist Containment Garment" issued to Buell on November 3, 1987, discloses a disposable diaper or incontinent garment having side-edge-leakage-guard gutters configured to contain free liquids within the garment. Each of these patents are incorporated herein by reference.

The stand-up barrier cuffs 50 provide a barrier to restrain the free flow of body exudates along the topsheet 41 and provide a structure to hold and contain such exudates within the diaper 20. Each of the stand-up barrier cuffs 50 is a flexible member having a proximal edge 91, a distal edge, an inboard surface, an outboard surface. In addition, if the spacing means comprises one or more spacing elastic members, the stand-up barrier cuffs 50 must be contractible so that the distal edges may be sufficiently spaced away from the topsheet 41 so that the channel formed along the stand-up barrier cuffs 50 is open to constrain, retain and hold body exudates within the diaper 20. The stand-up barrier cuffs 50 may be manufactured from a wide variety of materials such as polypropylene, polyester, rayon, nylon, foams, plastic films, formed films, and elastic foams. A number of manufacturing techniques may be used to manufacture the stand-up barrier cuffs 50. For example, the stand-up barrier cuffs 50 may be woven, nonwoven, spunbonded, carded, or the like. A particularly preferred stand-up barrier cuff 50 comprises a polypropylene material containing no finish or surfactant to render it liquid impermeable. A particularly preferred polypropylene material is manufactured by Crown Zellerbach Company as Celestra. In the preferred embodiment, the stand-up barrier cuff 50 comprises the same member or material of the extended leg cuff 60.

As shown in FIGS. 2 and 3, the stand-up barrier cuffs 50 are disposed adjacent each longitudinal edge 69 of the diaper 20 and are preferably disposed adjacent to an inboard of the extended leg cuffs 60; the proximal edges 91 being preferably disposed inboard of the proximal edges 63 of the extended leg cuffs 60. The proximal edge 91 of the stand-up barrier cuff 50 is preferably disposed inboard of the extended leg cuff 60, so that exudates, especially loose fecal material which is not easily absorbed and tends to float along the topsheet 41, will contact the channel portion of the stand-up barrier cuff 50 before it can contact the extended leg cuff 60. The stand-up barrier cuffs 50 are disposed adjacent the extended leg cuffs 60 to provide a more effective dual restraint against the flow of body exudates. The proximal edge 91 of the stand-up barrier cuff 50 is preferably disposed between the proximal edge 63 of the extended leg cuff 60 and the longitudinal centerline 71 of the diaper 20. Most preferably, the proximal edge 91 of the stand-up barrier cuff 50 is disposed between the proximal edge 63 of the extended leg cuff 60 and the side edge 43 of the absorbent core 45 in at least the crotch portion 33 of the diaper 20.

The proximal edges 91 and the distal edges 93 of the stand-up barrier cuff 50 are in spaced relation to each other and define the effective width of each of the stand-up barrier cuffs 50. The proximal and distal edges 91, 93 may be in a parallel, nonparallel, rectilinear or curvilinear relationship. In addition, each of the stand-up barrier cuffs 50 may have a variety of different cross-sectional areas including circular, square, rectangular or any other shape such as that shown in Figs. 2, 3 and 4. Preferably, the proximal edges 91 are spaced from the distal edges 93 in a parallel and rectilinear relationship to provide stand-up barrier cuffs 50 having uniform effective widths.

As shown in Figs. 2, 3, and 5, the distal edges 95 of the stand-up barrier cuff 50 are preferably disposed inboard of the proximal edges 91 of the stand-up barrier cuff 50 to present a more effective barrier against the flow of exudates. The distal edges 95 are maintained inboard of the proximal edges 91 by the closing means 103 so as to obviate their inversion. While the distal edges 95 may alternatively be disposed in other positions in relation to the proximal edges 91, such positions are not preferred.

The distal edges 95 are preferably not secured to any other element in at least the crotch portion 33 of the diaper 20 so that they may be spaced away from the topsheet 41. The distal edges 95 are preferably spaced away from the topsheet 41 so that the stand-up barrier cuffs 50 may form a channel 101 to enhance the

containment of the diaper 20. As used herein, "spaced" includes embodiments wherein the distal edges 95 may assume one or more positions relative to the topsheet 41 including at some times assuming a position adjacent the topsheet 41. The distance between a distal edge 95 to the topsheet 41 is measured along a line drawn from the distal edge 95 to the closest part of the topsheet 41 when the distal edge 95 is positioned so as to be spaced away from the topsheet 41 as far as possible (i.e., in the elastically contracted position).

The stand-up barrier cuffs 50 are preferably hydrophobic and more preferably liquid impermeable so as to prevent the strikethrough of body exudates. A liquid impermeable stand-up barrier cuff 50 retards the movement of liquid through the stand-up barrier cuff 50, thereby making it more leakage resistant. The stand-up barrier cuffs 50 may be rendered liquid impermeable in any manner well known in the art such as selectively treating the stand-up barrier cuffs 50, untreated the stand-up barrier cuffs 50, or by securing a separate material to the stand-up barrier cuffs 50. The stand-up barrier cuffs 50 may additionally be provided with absorbent means secured to or within the stand-up barrier cuff 50.

A preferred embodiment of the diaper 20 shown in Figs. 3, 4, and 5, is provided with each of the stand-up barrier cuffs 50 joined to the side flaps 37 (i.e., the backsheet 39). The term "joined" includes any means for affixing the stand-up barrier cuffs 50 to the diaper 20, and includes embodiments wherein the stand-up barrier cuffs 50 are separate members directly or indirectly adjoined to the side flaps 37 (i.e., integral) or embodiments wherein the stand-up barrier cuffs 50 are constructed from the same member or material as an element of the diaper 20 so that the stand-up barrier cuffs 50 are a continuous and undivided element of the side flaps 37 (i.e., unitary). The stand-up barrier cuffs 50 may alternatively be joined to the backsheet 39, the absorbent core 45, the topsheet 41 or any combination of these or other elements of the diaper 20 such as the extended leg cuff 60 as discussed before. In a preferred embodiment, both the stand-up barrier cuffs 50 and the extended leg cuffs 60 are integral with the side flaps 37. The integral stand-up barrier cuffs 50 and extended leg cuff 60 are thus preferably formed by a single separate strip of material with an intermediate segment adjoined to the side flaps 37 by the seal means 81 such as an adhesive to form the proximal edge 91, the distal edge being formed by folding an end of the material back upon itself and being secured to another segment by the distal attachment means, and the remaining portion of the material, the side flap 37 portions, extending and terminating outboard of the proximal edges 91 and preferably associated with the backsheet 39 by the seal means 81 to define a portion

of side flap 37 between the proximal edges 91 of the stand-up barrier cuff 50 and the proximal edges 63 of the extended leg cuffs 60.

The stand-up barrier cuffs 50 and the side flaps 37 (backsheet 39) are adjoined together in any suitable manner. As used herein, the term "adjoined" encompasses configurations whereby the stand-up barrier cuffs 50 are directly secured to the side flaps 37 by affixing portions of the stand-up barrier cuffs 50 directly to the backsheet 39, and configurations whereby the stand-up barrier cuffs 50 are indirectly joined to the side flaps 37 by affixing them to intermediate members which in turn are affixed to the backsheet 39. In a preferred embodiment, the stand-up barrier cuffs 50 and the side flaps 37 are adjoined directly to each other by a seal means 81 such as adhesive or any other attachment means such as heat/pressure sealing, ultrasonic bonding or any other methods as are known in the art. For example, a uniform continuous layer of adhesive, a patterned layer of adhesive, or an array of separate lines or spots of adhesive may be used. The seal means 81 is preferably a hot melt adhesive such as manufactured by Eastern Chemical Products Company of Kingsport, Tennessee and marketed under the tradename Eastbond A-3 or Century Adhesives, Inc. of Columbus, Ohio and marketed under the tradename Century 5227. In the preferred embodiment, the seal means 81 consists of a nonwoven fabric strip enclosing elastomeric adhesive. (It should be noted that the seal means 81 herein are preferably the same type of means as the seal means 81 for joining the proximal edges 63 of the extended leg cuff 60 to the side flaps 37).

The seal means 81 for adjoining the proximal edges 91 of the stand-up barrier cuffs 50 to the side flaps 37 provide a leakage-resistant seal along the proximal edge 91 to present a barrier to the wicking of liquid through the topsheet 41 so as to prevent liquids from wicking underneath the stand-up barrier cuffs 50 to the edges of the diaper 20.

The spacing means 105 for spacing the distal edges 95 away from the topsheet 41 is any member which gathers, contracts, stiffens, shortens or otherwise acts on the stand-up barrier cuffs 50 so as to cause the stand-up barrier cuff 50 to stand up to provide a channel 101 along the barrier cuff 50 that acts as a constraint against the leakage of exudates.

As shown in Figs. 2 and 3, the spacing means 105 preferably comprises a spacing elastic member 105 operatively associated with each of the stand-up barrier cuffs 50 adjacent the distal edge 95. The spacing elastic member 105 is preferably



secured to the stand-up barrier cuff 50 in an elastically contractible condition so that in a normally unrestrained configuration, the spacing elastic member 105 effectively contracts or gathers the distal edge 95 of the barrier cuff 50. The spacing elastic member 105 can be secured to the stand-up barrier cuff 50 in an elastically contractible condition in at least two ways as is discussed in the U.S. Pat. No. 3,860,003 that issued to K. B. Buell.

The length of the spacing elastic member 105 in general is dictated by the diaper design. In the preferred embodiment illustrated in FIG. 2, the spacing elastic members 105 extend essentially the entire length of the stand-up barrier cuff 50 in the crotch portion 33. In the most preferred embodiment, the spacing elastic members 105 extend beyond the crotch portion 33 any distance, including all the way to the end edges of the diaper 20, so as to provide the most effective spacing of the stand-up barrier cuffs 50 away from the topsheet 41.

As shown in FIG. 3, the spacing elastic member 105 is operatively associated with the stand-up barrier cuff 50 by securing it within the stand-up barrier cuff 50 with a spacing elastic attachment means 107. A detailed description of the manner in which the spacing elastic members 105 may be positioned and secured to the stand-up barrier cuffs 50 can be found in U.S. Pat. No. 4,081,301, issued to Buell on March 28, 1978, and in U.S. Pat. No. 4,253,461, issued to Strickland and Visscher on March 3, 1981, both of which are incorporated herein by reference. It should also be noted that one or more spacing elastic members 105 can be used to elasticize each stand-up barrier cuff 50.

A spacing elastic member 105 which has been found suitable is an elastic strand having a cross section of 0.18 mm by 1.5 mm and made from natural rubber as available from Easthampton Rubber Company of Stewart, Virginia, under the trademark L-1900 Rubber Compound. Other suitable spacing elastic members 105 can be made from natural rubber, such as elastic tape sold under the trademark Fulflex 9411 by Fulflex Company of Middletown, Rhode Island. The spacing elastic member 105 may also comprise any heat shrinkable elastic material as is well known in the art. Other suitable elastic materials may comprise a wide variety of materials as are well known in the art include elastomeric films, polyurethane films, elastomeric foams and formed elastic scrim. In the preferred embodiment, the elastic members 105 and the elastic attachment means 107 can be formed by an adhesive strip stretched having a thickness of 0.5 mil as available from Findlay Adhesives

Incorporated, Elm Grove, Wisconsin as Findley Adhesives 581, sold under trademark H 2330.

In addition, the spacing elastic members 105 may take a multitude of configurations. For example the width of the spacing elastic members 105 may be varied; the spacing elastic members 105 may comprise a single strand or several parallel or non-parallel strands of elastic material; or the spacing elastic members 105 may be rectilinear or curvilinear.

The spacing means 105 for spacing the distal edges away from the topsheet 41 may alternatively comprise several other elements as described before for the spacing means of the extended leg cuff 60.

The closing means 103 for securing the distal edges 93 of the stand-up barrier cuffs 50 together provide a more comfortable fit for the wearer and obviate inversion of the distal edges 93 of the stand-up barrier cuffs 50 during application and use. Inversion is generally defined as the inboard-disposed distal edges 93 turning outwardly when the diaper 20 is applied to the wearer.

The closing means 103 are preferably adhesive beads consisting of hot melt adhesives such as marketed by Eastman Chemical Products Company, Kingsport, Tennessee, as Eastbond A-3 or Century Adhesives, Inc. of Columbus, Ohio as Century 5227 although other closing means as are known in the art such as ultrasonic bonding or heat/pressure sealing may also be used.

The pull-on diaper 20 is applied to a wearer by placing the wearer's feet in the leg openings 28 and sliding the pull-on diaper up the legs into position, the stand-up barrier cuffs 50 and the extended leg cuff 60 should be disposed to provide the dispositions and functions described hereinbefore.

#### SIDE PANEL

The absorbent chassis 21 further comprises stretchable side panels 23 in the front portion 29 and the rear portion 31. The stretchable side panel 23 are separately manipulative elements secured to the chassis 21, but can be formed from extensions of the chassis 21 materials. The stretchable side panel 23 provide an elastically extensible feature that provides a more comfortable and contouring fit by initially conformably fitting the disposable garment to the wearer and sustaining this fit throughout the time of wear well past when the disposable garment has been loaded

with exudates since the stretchable side panel 23 allow the sides of the disposable garment to expand and contract.

As shown in Figure 2, each stretchable side panel 23 comprises that portion of the absorbent chassis 21 that extends laterally outwardly from and along the central portion 33 of the absorbent chassis 21 to the longitudinal side region of the absorbent chassis 21. The side panel 23 generally extends longitudinally from the end edge 109 of the absorbent chassis 21 to the portions of the longitudinal edge 69 of the absorbent chassis 21 that forms the leg opening 28 (this segment of the longitudinal edge being designated as leg edge ). The stretchable side panel 23 can be formed by the portions of the topsheet 41 and the backsheet 39 that extend beyond the side flap 37.

In a preferred embodiment, as shown in Figs. 4, the stretchable side panels 23 are formed by securing a piece of stretchable panel to the side edge 38 of the side flap 37 in the front portion 29 and the rear portion 31, so that the stretchable side panel 23 allow to be elastically extensible as desired in the lateral direction (laterally elastically extensible). As used herein, the term "elastically extensible" means a segment or portion of the chassis 21 that will elongate in at least one direction (preferably the lateral direction for the side panel) when tensional forces (typically lateral tensional forces of the side panel) are applied, and will return to about its previous size and configuration when the tensional forces are removed.

A more detailed description of such side panel 23 is shown in U.S. Patents 4,490,464; 4,938,753; and 4,938,757 all of which issued to Van Gompel, et al. These patents disclose a pant-like garment formed by attaching discrete stretchable members to the edge of each side flap 37 of the disposable garment in the front waist area and the rear waist area. The discrete stretchable members are described as being made by stretching an elastic or stretchable layer to a selected elongation, placing a nonstretchable layer, such as a nonwoven, on the stretched layer, bonding the layers together, and allowing the layers to relax so that the nonstretchable layer is gathered. A methods for making a stretchable member is described in U.S. Patent 4,107,364, issued to Sisson on August 15, 1978, U.S. Patent 4,209,563 issued to Sisson on June 24, 1980, U.S. Patent 4,525,407 issued to Ness on June 25, 1985, U.S. Patent 4,834,741 issued to Sabee on May 30, 1989, European Patent Publication 409,315, The Procter & Gamble Company, published January 23, 1991, all hereby incorporated by reference.

### SIDE SEAM

Referring again to Figure 1, the side seams 25 are preferably formed by bonding together the longitudinal side region of stretchable side panel 23 of the front portion 29 and the longitudinal side region of the stretchable side panel 23 of the rear portion 31. The seams 25 can be formed in a number of different ways. For example, the seams 25 can be formed by bonding together portions of outwardly extending longitudinal side regions to form an outwardly extending fin seam using any seam configurations that are known in the art. The bonding can be by any suitable means known in the art; thus ultrasonic bonding, heat sealing, adhesive bonding, and the like. Example of such seaming techniques are disclosed in U.S. Patent 4,355,425 issued to Jones, et al. on October 26, 1982; U.S. Patent 4,619,649 issued to Roberts on October 28, 1986; U.S. Patent 4,909,804 issued to Douglas, Sr. on March 20, 1990. These references are also incorporated herein by reference.

### ABSORBENT CHASSIS

The absorbent chassis 21 comprises a liquid pervious topsheet 41, a liquid impervious backsheet 39 joined with the topsheet 41, an absorbent core 45 positioned between the topsheet 41 and the backsheet 39. Figure 2 shows a preferred embodiment of the diaper 20 in which the topsheet 41 and the backsheet 39 length and width dimensions generally larger than those of the absorbent core 45. The topsheet 41 and the backsheet 39 extend beyond the edges 43 of the absorbent core 45. While the topsheet 41, the backsheet 39, and the absorbent core 45 may be assemble in a variety of well known configurations, preferred diaper configurations are described generally in U.S. Patent 3,860,003 entitled "Contractable Side Portions for Disposable Diaper" which issued to Kenneth B. Buell on January 14, 1975; and U.S. Patent Application Serial No. 07/715,152, allowed, "Absorbent Article With Dynamic Elastic Waist Feature Having A Predisposed Resilient Flexural Hinge", Kenneth B. Buell et al. filed June 13, 1991; each of which is incorporated herein by reference.

The absorbent core 45 may be any absorbent means which is generally compressible, conformable, non-irritating to the wearer's skin, and capable of absorbing and retaining liquids such as urine and other certain body exudates. As shown in Figs. 2 and 3, the absorbent core 45 has the side edges 43, and waist edges. The absorbent core 45 may be manufactured in a wide variety of sizes and shapes (e.g., rectangular, hourglass, "T"-shaped, asymmetric, etc.) and from a wide variety of liquid-absorbent materials commonly used in disposable diapers and other absorbent articles such as comminuted wood pulp which is generally referred to as airfelt. Examples of other suitable absorbent materials include creped cellulose

wadding; meltblown polymers including coform; chemically stiffened, modified or cross-linked cellulose fibers; tissue including tissue wraps and tissue laminates; absorbent foams; absorbent sponges; super absorbent polymers; absorbent gelling materials; or any equivalent material or combinations of materials. The configuration and construction of the absorbent core 45 may also be varied (e.g., the absorbent core 45 may have varying caliper zones, a hydrophilic gradient, a super absorbent gradient, or lower average density and lower average basis weight acquisition zones; or may comprise one or more layers or structures). The total absorbent capacity of the absorbent core 45 should, however, be compatible with the design loading and the intended use of the diaper 20. Further, the size and absorbent capacity of the absorbent core 45 may be varied to accommodate wearers ranging from infants through adults. Exemplary absorbent structures for use as the absorbent core 45 are described in U.S. Patent 4,610,678 entitled "High-Density Absorbent Structures" issued to Weisman et al. on September 9, 1986; U.S. Patent 4,673,402 entitled "Absorbent Articles With Dual-Layered Cores" issued to Weisman et al. on June 16, 1987; U.S. Patent 4,888,231 entitled "Absorbent Core Having A Dusting Layer" issued to Angstadt on December 19, 1989; and U.S. Patent 4,834,735, entitled "High Density Absorbent Members having Lower Density and Lower Basis Weight Acquisition Zones", issued to Alemany et al. on May 30, 1989. Each of these patents are incorporated herein by reference.

The backsheet 39 is positioned adjacent the garment surface of the absorbent core 45 and is preferably joined thereto by attachment means (not shown) such as those well known in the art. For example, the backsheet 39 may be secured to the absorbent core 45 by a uniform continuous layer of adhesive, a patterned layer of adhesive, or an array of separate lines, spirals, or spots of adhesive. Adhesives which have been found to be satisfactory are manufactured by H. B. Fuller Company of St. Paul, Minnesota and marketed as HL-1258. The attachment means will preferably comprise an open pattern network of filaments of adhesive as is disclosed in U. S. Patent 4,573,986 entitled "Disposable Waste-Containment Garment", which issued to Minetola et al. on March 4, 1986, more preferably several lines of adhesive filaments swirled into a spiral pattern such as is illustrated by the apparatus and methods shown in U. S. Patent 3,911,173 issued to Sprague, Jr. on October 7, 1975; U. S. Patent 4,785,966 issued to Ziecker, et al. on November 22, 1987; and U. S. Patent 4,842,666 issued to Werenicz on June 27, 1989. Each of these patents are incorporated herein by reference. Alternatively, the attachment means may comprise heat bonds, pressure bonds, ultrasonic bonds, dynamic mechanical bonds, or any

other suitable attachment means or combinations of these attachment means as are known in the art.

The backsheet 39 is impervious to liquids (e.g., urine) and is preferably manufactured from a thin plastic film, although other flexible liquid impervious materials may also be used. As used herein, the term "flexible" refers to materials which are compliant and will readily conform to the general shape and contours of the human body. The backsheet 39 prevents the exudates absorbed and contained in the absorbent core 45 from wetting articles which contact the diaper 20 such as bed sheets and undergarments. The backsheet 39 may thus comprise a woven or non woven material, polymeric films such as thermoplastic films of polyethylene or polypropylene, or composite materials such as a film-coated non woven material. Preferably, the backsheet is a thermoplastic film having a thickness of from about 0.012 mm (0.5mil) to about 0.051 mm (2.0 mils). Particularly preferred materials for the backsheet include RR8220 blown films and RR5475 cast films as manufactured by Tredegar Industries, Inc. of Terre Haute, IN. The backsheet 39 is preferably embossed and/or matte finished to provide a more cloth like appearance. Further, the backsheet 39 may permit vapors to escape from the absorbent core 45 (i.e., breathable) while still preventing exudates from passing through the backsheet 39.

The topsheet 41 is positioned adjacent the body surface of the absorbent core 45 and is preferably joined thereto and to the backsheet 39 by attachment means (not shown) such as those well known in the art. Suitable attachment means are described with respect to joining the backsheet 39 to the absorbent core 45. As used herein, the term "joined" encompasses configuration whereby an element is directly secured to the other element by affixing the element directly to the other element, and configurations whereby the element is indirectly secured to the other element by affixing the element to intermediate member(s) which in turn are affixed to the other element. In a preferred embodiment of the present invention, the topsheet 41 and the backsheet 39 are joined directly to each other in the diaper periphery and are indirectly joined together by directly joining them to the absorbent core 45 by the attachment means (not shown).

The topsheet 41 is compliant, soft feeling, and non-irritating to the wearer's skin. Further, the topsheet 41 is liquid pervious permitting liquids (e.g., urine) to readily penetrate through its thickness. A suitable topsheet 41 may be manufactured from a wide range of materials, such as porous foams; reticulated foams; aperture plastic films; or woven or non woven webs of natural fibers (e.g., wood or cotton fibers), synthetic fibers (e.g., polyester or polypropylene fibers), or a combination of natural and synthetic fibers. Preferably, the topsheet 41 is made of a hydrophobic

material to isolate the wearer's skin from liquids contained in the absorbent core 45. There are a number of manufacturing techniques which may be used to manufacture the topsheet 41. For example, the topsheet 41 may be a nonwoven web of fibers spunbonded, carded, wet-laid, meltblown, hydroentangled, combinations of the above, or the like. A preferred topsheet 41 is carded and thermally bonded by means well known to those skilled in the fabrics art. A preferred topsheet 41 comprises a web of staple length polypropylene fibers such as is manufactured by Veratec, Inc., a Division of International Paper Company, of Walpole, Massachusetts under the designation P-8.

While particular embodiments of the present invention have been illustrated and described, it would be obvious to those skilled in the art that various other changes and modifications can be made without departing from the spirit and scope of the invention. It is therefore intended to cover in the appended claims all such changes and modifications that are within the scope of this invention.

CLAIMS

## 1. An absorbent article comprising:

an absorbent chassis having a front portion, a rear portion, a crotch portion joining the front portion and the rear portion, and a pair of side edges in the longitudinal direction throughout the front, crotch and rear portion;

a pair of side flaps extending outwardly from each side edge of the absorbent chassis, each side flap having a side edge;

a pair of side panels extending outwardly from the side edge of the side flap in the front portion and the rear portion; and

a pair of longitudinal extended leg cuffs being connectively associated with the absorbent chassis along the side flap in the crotch portion and extending longitudinally at least partially into the front portion and the rear portion;

each of extended leg cuffs having a free distal edge remote from the side edge of the side flap at least in the crotch portion so as to extend outwardly from the side flap; and

each of the extended leg cuffs comprising a spacing means disposed in at least the crotch portion for spacing said distal edge upwardly away from the absorbent chassis.

2. The absorbent article of claim 1 wherein said spacing means comprises a spacing elastic member.

3. The absorbent article of claim 1 wherein said extended leg cuffs are liquid impermeable.

4. The absorbent article of claim 1 wherein said extended leg cuff are integral with the side edge of the side flaps.

5. The absorbent article of claim 1 wherein the side panel comprises a stretchable panel.



6. The absorbent article of claim 5 wherein the side panels in the front portion and in the rear portion are joined by seams so as to create/maintain lateral tension through at least a portion of said front portion and said rear portion.

7. The absorbent article of claim 1 wherein said side panels additionally comprises a closure system for creating/maintaining lateral tension through at least a portion of said front portion and said rear portion.





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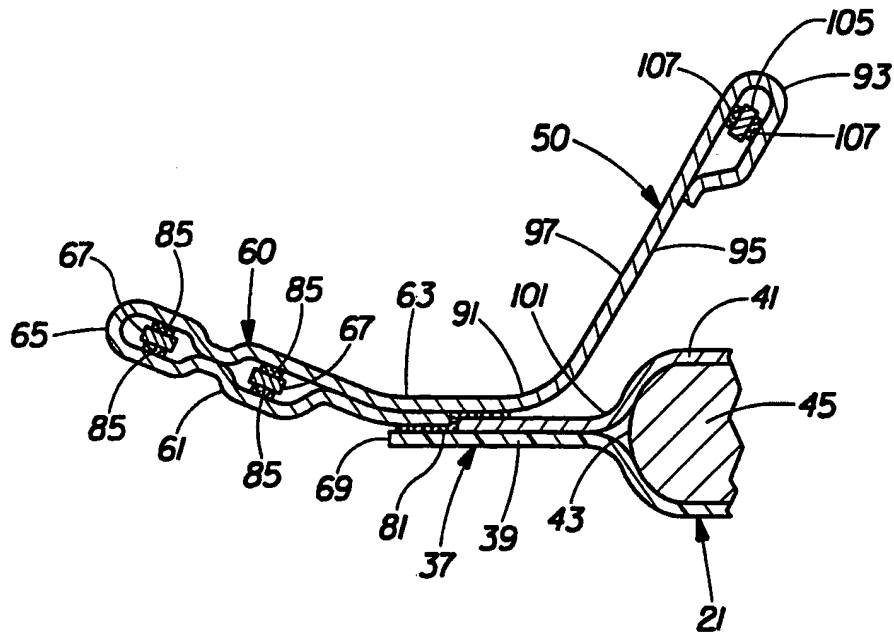


Fig. 3

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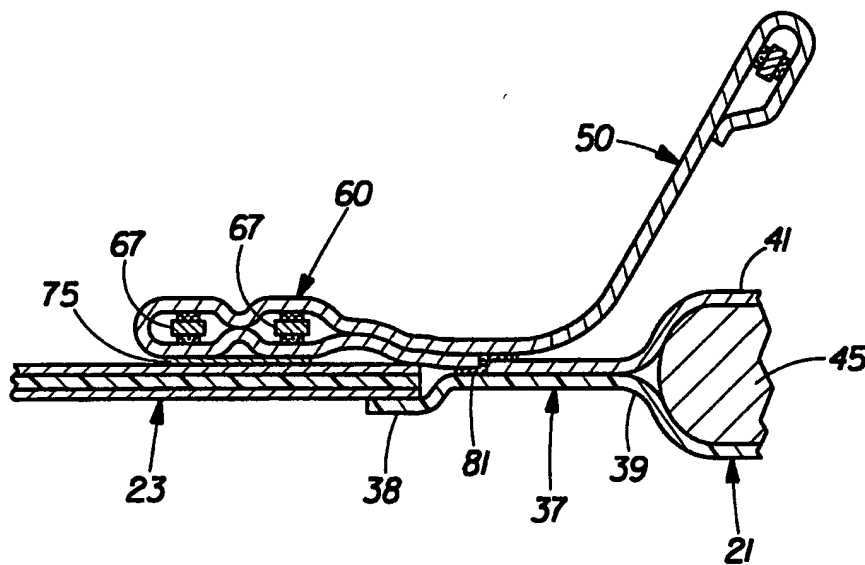


Fig. 4

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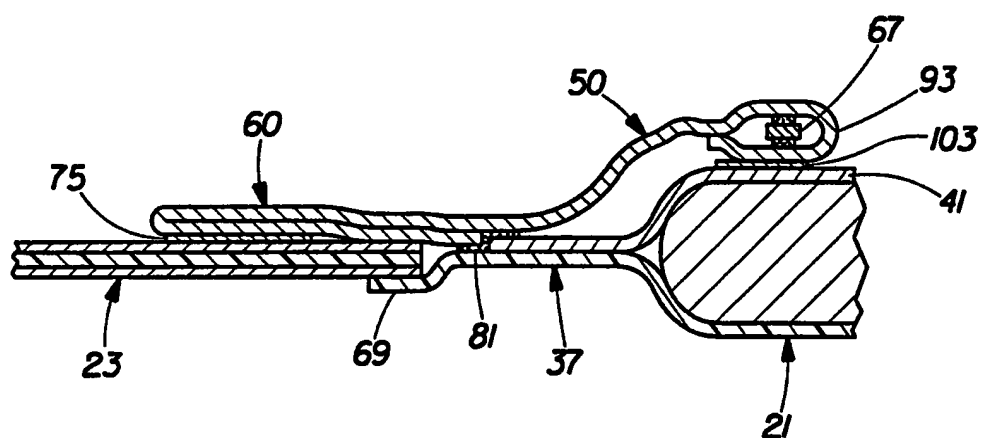


Fig. 5

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US94/01767

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(5) :A61F 13/15

US CL :604/385.2, 396

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 604/385.1, 385.2, 394, 396

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

None

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

None

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	JP, A, 3-101935, (KAO CORPORATION), 23 October 1991. See figures.	1-2, 4-5, 7 ----- 3, 6
Y	US, A, 4,205,679, (REPKE ET AL.), 03 June 1980. See column 15, lines 39-45.	6
Y,P	US, A, 5,246,432, (SUZUKI ET AL.), 21 September 1993. See column 2, lines 29-36.	3

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:	*T	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
*A* document defining the general state of the art which is not considered to be part of particular relevance	*X*	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
*E* earlier document published on or after the international filing date	*Y*	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
*L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*Z*	document member of the same patent family
*O* document referring to an oral disclosure, use, exhibition or other means		
*P* document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search

20 MAY 1994

Date of mailing of the international search report

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